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OPHTHALMIA NEONATORUM:

A PRIZE ESSAY.

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INTRODUCTION.

THIS paper is presented to the readers of the MEDICAL CHRONICLE as a literal translation of the essay accepted by the "Parisian Society for the Protection of Infant Life." The illustrations have of necessity been suppressed, the short abstracts of "The discovery and history of the gonococcus" being the only addition to the original.

PRELIMINARY CHAPTER.

PURULENT OPTHALMIÆ.

Amongst eye diseases of a specific or so-called inflammatory type, those specially affecting the conjunctiva are of vast importance, not only to the welfare of the organ of vision primarily attacked, but because of their infectious nature and influence upon communities as well as individuals. Of these, the most dangerous to the eyes are the "Contagious ophthalmiæ," which, tabulated in the order of their pathological importance, are "Diphtheritic ophthalmia," "Gonorrhœic ophthalmia," "Purulent ophthalmia," and "Catarrhal ophthalmia."

Now all these have in common a discharge more or less profuse, purulent, and contagious; and whilst there is sufficient individuality to enable us to classify them separately, the last three, when they attack a newborn child, are grouped together under the generic title of "ophthalmia neonatorum," and it is well to grasp this fact thoroughly, because the separation indicated above, distinct enough in the adult, is in the majority of cases clinically impossible in the infant.

STATISTICS.

It will be interesting here to study the statistics of this disease, and to note the number of cases and the complications as they present themselves in the institution to which I have the honour to belong. A glance at the appended table affords an ample and sufficient reason for the important step which the "Society for the Protection of Infant Life" has thought it advisable to take.

I believe that in no other institution in Europe is such a table compiled as the one here presented; therefore, it becomes of extreme value

for reference and comparison. The decade from 1876 to 1886 has been selected, during which time the aggregate number of eye patients that have passed through our hands have been 112,421; this number includes 3,517 examples of ophthalmia neonatorum, a sufficient number from which to gain a perfect knowledge of every phase of the disease. Since 1881 these cases have been arranged in order of complication, even the most trivial deviation from corneal health being noted.

NUMBER OF PATIENTS PRESENTING THEMSELVES AT THE HOSPITAL IN TEN SUCCESSIVE YEARS, WITH CASES OF OPHTHALMIA NEONATORUM SELECTED FROM THEM.

1876...	7,477	general eye diseases include 293 cases of Ophthalmia Neonatorum.			
1877...	8,325	"	"	313	"
1878...	8,591	"	"	413	"
1879...	8,573	"	"	270	"
1880...	10,262	"	"	423	"
1881...	10,919	"	"	400	"
1882...	12,961	"	"	539	"
1883...	14,702	"	"	358	"
1884...	15,427	"	"	310	"
1885...	15,184	"	"	198	"

Total 112,421

Total 3,517

It will at once strike the reader that whilst in 1876, with a total of 7,477 general eye diseases, 293 cases of ophthalmia neonatorum presented themselves, in 1885, with a total of 15,184 cases of general diseases, only 198 examples of ophthalmia neonatorum came for treatment—a reduction of two thirds—and we may fairly assume that this extraordinary fall in numbers is partly due to the dissemination of leaflets by the Sanitary Associations, treating of the measures for protection, and partly to a better acquaintance among medical men with the mode of cure and its urgency.

COMPLICATIONS.

On their first appearance at the hospital a careful record was kept of all the corneal complications, amounting to 1,405; in these we have the cornea involved 698 times in the following manner:—

One or both corneæ were affected in 234	Both eyes were perforated in 8
One cornea only affected in 148	Both eyes were ulcerated in 30
One eye lost in 37	Both eyes were leucomatous in ... 3
Perforation of cornea in 24	Both eyes were hazy in 10
Ulcer of cornea in 61	One lost other ulcerated in 7
Leucoma in 5	One lost other leucomatous in 3
Hazy in 22	One perforated other ulcerated
Both corneæ were affected in 85	(lead deposit) in 1
Both eyes were lost in 15	One hazy other ulcerated in 5

REMARKS ON COMPLICATIONS (STATISTICS).

It may be accepted as the experience of those skilled in ophthalmic science that under efficient surgical and nursing treatment no eye need

be lost or even seriously injured if seen sufficiently early in the disease ; yet here we have fifteen people totally blind, thirty-seven with only half the natural visual complement, thirty-two corneal perforations with their attendant dangers, eight leucomatous and permanently damaged, and a large percentage of the remainder more or less injured.

The loss to the community is considerable, for the defective vision of these poor people militates against their wage earning, and they require to be largely supported by the gifts of the charitable.

We shall devote the remaining chapters of this monograph to show how these disasters may be prevented or lessened.

OPHTHALMIA NEONATORUM.

DEFINITION.

A blennorrhœal disease of the palpebral conjunctiva of a newborn or comparatively newborn child.

ORIGIN OF THE DISEASE.

Direct inoculation of the conjunctival membrane by a specific poison. The inoculation may be "primary" or "secondary." *Primary*, when materno-fœtal inoculation takes place during or immediately after birth. *Secondary*, when the disease commences after such a lapse of time as to insure its being the outcome of post-partum inoculation (see Incubation). This will include the infection of one eye from its fellow, infection by unclean sponges, soiled fingers, handkerchiefs, and its evident transmission from child to child (see Method of Infection).

The social and diagnostic importance of these divisions, though arbitrary, can scarcely be overrated when read by the light of the nature of the infecting material, and as a guide to the trustworthiness, cleanliness, or otherwise of the nurse in charge.

INCUBATION.

The period of incubation is about 50 hours, occasionally much less, but varies with the potency of the infecting material. When prolonged to three or four days, it is doubtless due to feeble infecting material, or unusual resisting power of the conjunctiva.

The outbreak of the disease after the fifth day may be accepted as positive proof that secondary inoculation has taken place.

It is a well known physiological fact that the eyelids of the fœtus are not only closed, but the edges incurved, till after birth, thus affording an apparent security against the introduction of infecting particles ; that this security is only apparent, we shall easily demonstrate.

METHOD OF INFECTION.

In treating of the method of infection, we shall retain the divisions, Primary and Secondary, mentioned under the head of Inoculation, afterwards proceeding to discuss the more difficult question ; "*of the nature of the morbid material required to produce these varying phenomena.*"

Primary conjunctival inoculation takes place by one of the following methods :—

(1) In utero with a face presentation, the obstetrician transmitting the infection on his finger during examination. Should the birth be delayed, it is conceivable that the infant might be born with the disease developed.

(2) By the application of instruments to expedite birth, the eyelids being accidentally opened by their use ; a more probable mode of infection than the preceding.

(3) By the retention of contagious muco-pus upon the child's eyelids after birth, and its subsequent inoculation by the natural movements of hands, eyelids, &c., the use of a dirty sponge, or careless handling on the part of the nurse at the first washing.

(4) By the direct introduction of contagious muco-pus into the eyes by the edge of the perinæum. Thus :—

During the passage of the fœtal head through the external orifice, the anterior edge of the perinæum becomes a tight, elastic, curved cord, which, after slipping over the forehead, presses for a shorter or longer time on the eyelids parallel to the palpebral fissure, eventually depositing more or less vaginal secretion within them. This is easily verified physiologically and clinically.

Physiologically : The elongation of the head, with distension of soft parts, the natural accompaniment of parturition, together with the immature development of the nasal bones, and absence of the bridge, presents the two eyes projecting *en profile*. There is thus nothing but the eyes covered by the closed lids to support the curved, tight, elastic, perinæal edge. As the uterus forces the head down, the perinæal edge is pushed over the upper lids to the palpebral fissure, enlarges it for a moment by pushing the lower lid down, and entering the fissure thus performs the inoculation.

Clinically : I had, to the best of my belief, the satisfaction of first pointing out this mechanical action of the perinæum, and it may be found in one of a series of papers written by me some time since, and which can be verified at a later date if desired ; the fact has been mentioned to a few medical confrères to whom it was new. I first observed this method of inoculation some years ago, whilst assisting a confrère at a difficult accouchement ; and knowing something of the marital relations which existed, there was little difficulty in prognosing ophthalmia neonatorum, which, as had been foreseen, developed at the commencement of the third day. Being anxious to verify the prognosis, and incubation period, no precaution, save excessive cleanliness, was adopted—under treatment, the child made an uninterrupted recovery. As we might suppose, where the infectious material exists, the children of primiparæ are specially

liable, they making 80 per cent of the numbers attacked. Next in order of frequency are those born after tedious labours, with weak expulsive pains at the finish. So also Haussman's observation is necessarily correct, that boys are more liable than girls, though his explanation of the cause is insufficient.* A reference to the above makes it obvious that the head in boys being larger than girls is less frequently projected through the external orifice, without that momentary perinæal rest which, as I have shown, enables inoculation to take place, and the perinæum of a primiparous woman being inelastic, is incomparably more likely to force open the lids than that of a multiparous woman, in whom it dilates with ease and rapidity.

SECONDARY INOCULATION (ITS METHOD).

Early in this paper we stated that the importance of this portion of the subject could not be over-rated, testifying as it does—with scarcely an exception—to the want of care exercised over the mother and child after parturition, to the absence of cleanliness on the part of the nurses, to the defective hygienic and sanitary condition of rooms, wards, or *crèches*. In a few words "Secondary inoculation, where reasonable care and cleanliness is experienced, can scarcely occur." We will point out how it may occur when such care and cleanliness have not been exercised :—

(a) By not wiping the eyes of the child at birth.

(b) By using unclean linen or other material for the purpose of cleansing the eyes.

(c) By using the same water for the head and face that have been used for the body and limbs.

(d) By neglecting the use of a disinfectant to the child's eyes when vaginal discharge is known to have been present in the mother before the birth.

(e) By using the same sponge to cleanse the face of the infant that has been used to the maternal passages. N.B.—The risk of inoculation is enormously increased by neglecting to remove infected lochia by syringing.

(f) By not washing the hands after adjusting and washing the mother before washing and dressing the child.

(g) By using the same water, cleansing material, or sponge to a healthy infant that has been used to one affected with ophthalmia neonatorum.

(h) By the fingers of the mother, if suffering from vaginitis.

(i) By overcrowding, thus favouring extension of the disease.

(j) By want of isolation, the healthy and diseased being allowed to

* Haussman's view is that the head is longer in the passage—*ergo*, there is more chance of infection taking place. He makes no mention of the perinæal action, the true cause.

mix indiscriminately together. Lefort (Paris) has laid stress on separation, and with the happiest results.

We have shadowed forth the means by which secondary inoculation is most frequently performed; but there are ways in which it may be carried, apart from any failure of the nurse in her duties. Of these, flies, and infection by dried particles floating in the air, are the most frequent; but both are preventable by the adoption of appropriate measures, which will be discussed under the head of preventive treatment.

Of the conjunctival affections in new-born children, caused by local irritants, as soap, spirits, draughts of cold air, exposure to bright light, we need say no more than that such may occur, but they are amenable to simple remedies.

NATURE OF INFECTIVE MATERIAL.

On all pathological questions exactitude is desired, yet a certain amount of latitude is usually permissible, on this special point, viz., *The nature of the infective material causing ophthalmia neonatorum*; doubts still exist, and these doubts are accentuated by the interchangeable nature of the ophthalmiæ, due to the receptivity or otherwise of the infected conjunctivæ. Swanzy, on "Diseases of the Eye," p. 82, writes: "The secretion from any given form of blennorrhœa will not always reproduce that form, but may give rise to another, of greater or less severity." This we can all endorse. I have repeatedly inoculated eyes suffering from pannus corneæ with blennorrhœic matter, but the resulting blennorrhœa could be in no way forecast by the originating disease. The investigations of Neisser (C. J. M. W., 79) bearing upon this point are, "that the same bodies, viz., large round micrococci, which he considers characteristic, are found with equal certainty in gonorrhœal urethritis, simple non-specific vaginitis and ophthalmia neonatorum," showing that they are analogous, although the true morbiæ infecti may still be hidden, and I point to this fact, which cannot be refuted, "that a vaginitis may infect an eye and develop a severe, even destructive, attack of ophthalmia neonatorum identical in its course with true gonorrhœic ophthalmia, and yet be totally unable to develop a urethritis in the male."* We all know that purulent secretion from an acutely inflamed lachrymal sac, or a chronic dacryo-cystitis will not give rise to anything but the mildest blennorrhœa of the most easily curable type. Yet I have seen, and not a few times, that it possesses micro-organisms of special virulence for an operation such as a cataract extraction, undertaken on a patient with chronic lachrymal abscess usually terminates rapidly in the destruction of the eye. These micrococci also possess powers of penetration, for I have seen them destroy a healthy eye

* Vide "Kroner of Breslau," Abstract from.

with only a tiny cystoid cicatrix, through which they had evidently entered the interior of the globe. As, then, this purulent secretion, possessing infecting powers of a high order, is unable to induce an acute blennorrhœa, in what does the special virulence of the vaginal secretion consist? We do not know with certainty; but as it is clinically identical with that from undoubted gonorrhœic vaginitis, we may, for the purpose of curative and preventive treatment, assume them to be the same. The experiments of Bumm* are of the highest possible interest in relation to this point. By cultivation he produced a pure gonococcus, and demonstrated the invasion of the conjunctival structures and life history of the organism; he also, by removing successive morsels of conjunctivæ, from the first to the thirty-second day of an attack of ophthalmia neonatorum, demonstrated the growth in the tissues, the penetration between the superficial epithelial cells, the pouring out of leucocytes, the infiltration of the mucous membrane marking the purulent stage, and the recession with commencement of repair. The purulent is the actively infectious stage, because the gonococci are not only contained in the pus cells and cast off in large quantities, but are also free and permeate the discharge. We know that the palpebral conjunctiva is specially selected for the attack of this organism. It is due to its being covered with cylindrical epithelium, forming the most suitable soil for their rapid growth, whilst the pavement epithelium of the ocular surface resists its invasion, and Bumm has clearly demonstrated the resisting power of this epithelium by showing the invading gonococci suddenly stopped at the junction of the pavement and cylindrical epithelium. I think there is no doubt that this micro-organism has high penetrating power, for during the present year I have seen an infant born at the seventh month—after an exceptionally easy labour—with well-marked ophthalmia neonatorum. The child was brought eight hours after birth by the midwife; there were the usual symptoms of the second stage. The case eventually did well, but was very protracted. Here, then, the child was infected in utero at least two days before birth or rupture of membranes. I leave to speculation the manner of infection.†

THE DISCOVERY AND HISTORY OF THE GONOCOCCUS.

This mischievous micro-organism has been deemed worthy of a literature of its own, which Sinclair tells us has already reached "eighty papers"; we can scarcely consider ourselves compensated for the literary labour involved in wading through this mass, to find observers of equal competence differing from each other on vital points. Below are abstracts from a few papers of special importance to the ophthalmologist:—

* "Der Mikro-Organismus der gonorrhœischen Schleimhaut-Erkrankungen 'Gonococcus Neisser.'" Wiesbaden: J. F. Bergmann.

† For an exhaustive treatise on gonococcal infection, see "Sinclair on Gonorrhœal Infection in Women," *Medical Chronicle*, Nos. 3, 4, 5, 6, Vol. VI.

In 1869 Hallier¹ sounded the first note by his discovery of gonococci.

Ten years later, Albert Neisser² took up Hallier's investigations, and gave the first great impulse to workers in the gonocoeal field.

In 1880 came A. Bokai,³ who advanced a step by obtaining a pure cultivation of these gonococci for the purpose of experiment.

In the same year came Weiss,⁴ of Nancy.

Next, in 1881, we find Haab,⁵ who considers all the cases of ophthalmia neonatorum, where these gonococci are found, to be gonorrhœal, whilst the cases where they are not demonstrable, he considers due to purulent catarrh. I have before pointed out that this difference is more interesting to the pathologist than of real clinical value.

Neisser⁶ again comes forward in 1882 with a valuable addition to his former paper.

And then Leistikow⁷ tells us where these gonococci are seated, viz., in the pus cells, bursting the cell wall by their multiplication.

In 1883, Bockhart⁸ experiments on a dying man! And so far these observers agree.

But now Sattler (of Erlangen) and Eklund⁹ both independently challenge the former views, whilst Zweifel upholds them.

Next comes Bumm,¹⁰ whose work is of the first value, and giving evidence of laborious research, but even he upsets Neisser's views by announcing the discovery of more than one diplococcus identical in form with Neisser's gonococcus.

The next paper of value is by Kroner,¹¹ of Breslau, whose experiments confirm the views given by me, for with the utmost care, out of 93 cases of ophthalmia neonatorum whose clinical features were identical, laborious microscopical research failed to find gonococci in 29. Many other papers have been written, but I need refer to no more, as the usual conflict of scientific opinion still rages. Once again I refer my readers to Dr. Sinelair's valuable and exhaustive monograph, where many papers referring to gonorrhœal infection in women are given in abstract.

1. *Zeitschrift für Parasitenkunde*, 1869, Bd. 1, p. 179.

2. "Ueber der Gonorrhœ eigenthümliche micrococcusform."—*Centralblatt für die medicinischen Wissenschaften*, 1879, No. 28.

3. "Ueber das Contagium der acutum Blonorrhœa."—*Allgemein. med. Central Zeitung* 1880

4. Weiss. "Thèse. Nancy, 1880." *Annales de Dermatologie*, 1881.

5. Haab's *Korrespondenzblatt für Schweizer Aerzte*, 1881, Nos. 3, 4.

6. "Die micrococci der Gonorrhœ."—*Deutsche med. Wochenschrift*, 1882, p. 279.

7. Abstract in *Centralblatt für die med. Wissenschaften*, 1883, No. 22.

8. Abstract in *Centralblatt für Gynäkologie*, 1884, No. 36.

9. "Zur Ätiologie der Ophthalmoblennorrhœa neonatorum."—*Archiv für Gynäkologie*, Bd. XXII Heft 2.

10. E. Bumm's first paper—"Beitrag zur Kenntniss der Gonorrhœ der weiblichen Genitalien."—*Archiv für Gynäkologie*, Bd. XXIII. Hft. 3.

11. "Zur Ätiologie der Ophthalmoblennorrhœa neonatorum,"—*Archiv für Gynäkologie*, Bd. XXV.



SYMPTOMS.

The course and symptoms of a typical, unchecked example of this disease are well known, and possess certain features which are very noticeable. We may divide it into stages, four in number :—

First stage—incubation ; second stage—lymph-secreting, slightly infectious ; third stage—pus-secreting, very infectious ; fourth stage—recession.

First stage : This, as we have already seen, is a fairly defined period of about 50 hours, occasionally extending to three or four days. During this time the only noticeable change is redness (hyperæmia) of the conjunctivæ, with a feeling of heat and prickling in the eyes, to be followed by—

The second stage : This is noticeable in that the eye discharges freely a secretion which, though sticky and coagulable, is clear and only slightly infectious. The papillary congestion of the palpebral conjunctivæ is now becoming very apparent. The whole conjunctiva is œdematous, and the lids swell. The secretion, in the course of a few hours, becomes cloudy, with shreds of lymph, passing into—

The third stage : Now the symptoms are greatly aggravated. The conjunctival papillæ of the lid pass from congestion to acute hypertrophy, the epithelium is gone, and the mucous membrane laid bare ; the inner surface of the lid becomes a pus-secreting surface, pouring out almost incredible quantities of purulent matter, varying in colour from pale cream to saffron yellow, and occasionally blood-stained from venous oozing. The lids are swollen, but soft—a fact to be carefully noted, as fibrinous infiltration and hardening of the lids is diagnostic of diphtheritic conjunctivitis—their colour, at first bright red, gradually passes to purple,* due to distended veins from pressure congestion. The temperature is increased, and the edges are glued together, only to be burst open by the pent-up secretion, which, when released, pours over the child's face, and, drying in masses on the lids, forms a painful pathological picture. Upon forcibly opening the lids, the pent-up pus gushes forth, and is often followed by the enormously distended conjunctivæ, which protrude through the lids in vascular folds, bleeding freely at the slightest touch. Should the case be uncomplicated by corneal lesion, after a varying period of some weeks—

The fourth stage, which is a spontaneous subsidence of the symptoms, in something like the inverse order of their occurrence, gradually draws on. Thus the papillary hypertrophy subsides, the œdema passes away, the pus secretion becomes less, until it is hardly noticeable, and eventually disappears ; the epithelium is re-formed, the swollen lids regain their normal appearance, and the child opens its eyes without difficulty, and

* A livid purple lid is suspicious, and very often associated with corneal perforation.

with care and cleanliness a perfect return to ocular health may be looked for. Usually this happy consummation does not take place unless medical treatment has been invoked, the disease not infrequently presenting, during the third stage, serious complications which may totally destroy vision.

COMPLICATIONS.

It is in the complications, which for the most part affect the cornea that the danger to vision consists, but there are certain conditions of the lids which undoubtedly militate against recovery. These are—

(a) A short palpebral fissure, short lids, and (b) Lympho-membranous deposit on the palpebral conjunctivæ.

McKenzie, of Glasgow, first called attention to short lids as seriously influencing the course of this disease by increasing the pressure on the cornea, and the difficulty of the escape of the pent-up pus.

"Lympho-membranous deposit," which is usually accompanied by a thin, flaky discharge, rather than the creamy pus of the simple disease, is certainly a complication, although Horner refuses to attach any importance to it. This membrane, which is a thin greyish coating of the palpebral conjunctiva, occasionally spreading on the ocular surface, is altered lymph in no way identical with diphtheritic exudate. De Wecker has carefully differentiated the two diseases in a thesis*. The essential points of separation are that *diphtheritic organisms* infiltrate the whole lid, turning it into a hard resisting mass, of vastly increased temperature. They strangulate the vessels, destroy the texture, and spreading rapidly to the ocular conjunctiva, necrose the cornea, and not unfrequently cause death by extension to the face, and constitutional infection. It is therefore a *distinct disease*. Lympho-membranous deposit never infiltrates the texture of the lid, but remains on the surface of the palpebral conjunctiva, whence it can be wiped off, leaving a raw surface. It never spreads to the face, nor does it in any way affect the constitution, prejudicially, *per se*; it is therefore an *incident* rather than a disease, but it is nevertheless a complication, because those children suffering from it require more careful constitutional treatment than those in whom it has not developed. It is interesting to note that with the cure of ophthalmia neonatorum, the conjunctiva regains perfect health, and there should be no cicatricial contractions, although it is probably more sensitive to contagious influences than one that has never been attacked. Nettleship disputes this fortunate result, and states that cicatricial contractions of the conjunctiva are the natural sequelæ of ophthalmia neonatorum. Sight has apparently been lost of the important part played by caustics in the production of these changes, and he attributes to the disease what is really an effect of a remedy. Some authors

* "Membranous conjunctivitis," 1861.

consider that another complication of the lid known as trachoma* is a further development of ophthalmia neonatorum. My own experience does not warrant me in this belief, but rather that the unwholesome surroundings which favour the outbreak and spread of ophthalmia neonatorum, and the granular condition of the conjunctiva, which occasionally persists for a shorter or longer period, no less favours the development of trachoma, which is directed in determining a locale by the disease which has preceded it.

CORNEAL COMPLICATIONS.

In corneal complications and their effects upon the other structures of the eye, lie the dangers to vision. These complications are essentially destructive in their nature, and whether the cornea be perforated in its entire thickness or only through a portion of its layers, the stages through which it passes are the same. These are—(1) erosion; (2) maceration and softening; (3) micrococcal infiltration and necrosis; (4) repair. A knowledge of the anatomical relations of the corneal layers and spaces assists us in appreciating these processes. They will be found in special works devoted to the subject.

The appearance of corneal destruction varies with the amount of structure involved and the depth of the excavation. There may be haziness, a deep pit, or necrosis of the whole cornea.

The chief factors in the production of corneal complications are, the sealing of the lids by hardened discharge, so that for some hours a stagnant irritant fluid (blennorrhœic muco-pus) is brought into contact with the corneal surface. This, assisted by a gradually increasing pressure, destroys the epithelium by erosion. The anterior corneal layers are bared, macerated, and softened. Into these layers micrococci, not necessarily gonococci, penetrate, undermining and causing disintegration of their substance in the manner described by Dr. Dallinger, in his interesting paper on "The Disintegration of Animal Tissue." This process is repeated, layer by layer, until the membrane of Descemèt is reached, which protrudes as a clear bead into the gap formed by the necrotic process, and at length, giving way, discharges the aqueous fluid. Should the corneal aperture be large, the lens is frequently evacuated, either spontaneously or by the action of the attendant.

This accident (lens evacuation), serious as it may be considered, is often of great value in promoting healing and rapid contraction, as well as lessening the tendency to increased tension of the globe. Usually the disease is arrested here. If not, the other layers of the eyeball are in turn attacked. a purulent choroiditis is set up, with eventual contraction

* Trachoma is an affection of the conjunctiva, accompanied by hard sago-like granules, which rub the cornea and produce pannus. It eventuates in cicatricial contractions of the lids, and is due, according to Neisser, to the same large micrococci that cause ophthalmia neonatorum. The proof is insufficient.

of the globe into a small irritable stump. Should we be fortunate enough to arrest the disease after perforation and evacuation of the lens, the fourth stage—that of repair—commences. The iris becomes adherent to the margin of the opening, a layer of lymph coats its surface, and contraction takes place. Should the iris be totally adherent, thus cutting off the efferent channels of the front of the eye, a glaucomatous condition at once supervenes, bulging of the remains of the cornea and lymph-covered iris takes place, and an anterior staphyloma, with secondary enlargement of the whole globe and deep optic nerve excavation, inevitably follows.

If the perforation be small and eccentric, a plug of iris (myocephalon) may block the aperture, and the eye eventually recover, with useful vision. Even then it is not safe from glaucoma, which may progress in a very insidious manner, and slowly destroy sight.

Should the central perforation be small, the iris may keep from entanglement, but the lens capsule is brought near the cornea, and not infrequently nutritive changes occur, resulting in the formation of a white pyramidal mass in the anterior capsular layers, seriously interfering with sight, and producing the tremor of the globes known as nystagmus. But it is during and after repair that we are able to appraise the extent of the disaster. The cornea cannot be perforated in its entire thickness without leaving very distinct traces, though they may be comparatively slight. At other times a dense leucoma is formed, disastrous to vision, or with less destruction of tissue, less dense opacities, even to the finest nebula. In what lies the difference between “leucoma” and “nebula”? It is more than a difference of degree. “Leucoma” is the *substitution* of dense white cicatricial tissue for true corneal elements, and is irremovable. “Nebula” may be also irremovable, but it is the *addition* of opaque elements in many instances, and infiltration into the true corneal texture. This is typically the case in the sclerosed patches which we see dotted over the cornea, and so seriously interfering with vision, and which are in many instances coincident with, if not diagnostic of, increased tension of the eyeball (glaucoma). With all opacities in the line of sight come diminished acuteness of vision, often alterations of corneal curvature and astigmatism. A distressing interstitial deposit is sometimes seen when neither ulceration nor other destructive change can be noted; this gives the cornea the appearance of ground glass, but with a clear circumcorneal zone, too narrow to be of any value. I have not found this condition remediable, although De Wecker speaks highly of saline subconjunctival injections as a means of cure. This is not the place to discuss the question of glaucoma, but as it is a frequent concomitant of corneal affections, we notice it, and warn the reader that during repairs, by the blocking of the efferent channels by effete products, increased tension of

the globe sometimes arises, and is one of the most dangerous complications. It should be anxiously watched for, to be treated with energy and decision.

Before leaving the subject of complications, it is interesting to note that neither hypopyon nor true onyx occur in ophthalmia neonatorum; so also is it rare to find iritic complications without previous corneal perforation. Purulent destructive changes of the globe are sufficiently infrequent; when they do occur, the other eye is in danger of sympathetic disease—a secondary septic invasion—and of these cases I have notes. In the chapter on the treatment of complications I shall show how this terrible calamity may be prevented.

CONSTITUTIONAL SYMPTOMS.

It may easily be inferred that a local affection of some gravity would produce constitutional response. Such is the case: fever, nervous irritability, stomach irritation and general depression are the usual accompaniments of this affection.

TREATMENT.

The “preventive” and “curative” treatment of ophthalmia neonatorum is of the first importance in our endeavour to stamp out the disease, or restrain it within very contracted limits, and it will be well to consider whether its outbreak is confined to one class or diffused evenly through every grade of the community.

For the purpose of this paper we will divide women into two classes.

(1) Those who are *able* to obtain skilled assistance during and after parturition.

(2) Those who are *unable* to do so.

It will be a matter of little surprise that from the second class come the vast majority of cases of “ophthalmia neonatorum,” and from these, little can be expected in the way of “preventive treatment.” In the first class, preventive treatment, directed to the mother and child, should be almost uniformly successful, and I point with satisfaction to the Great London Maternity Hospital of Queen Charlotte, where irrigation of the maternal passages during the second stage of labour with disinfecting solutions, has reduced the cases of ophthalmia neonatorum to the most insignificant proportions; whilst Credé’s method of disinfection of eyes of new-born children is also a valuable adjunct to prevention.

“PREVENTIVE” TREATMENT.

(1) Cure of all cases of chronic vaginal discharge before labour by suitable local applications.

(2) Irrigation of the vagina during the second stage of labour when vaginitis is known to exist. This plan, adopted in London, at Queen Charlotte’s Hospital, is almost uniformly successful. The solution in use is hydrarg. corros. sublim., 1 part to 2,000. Nature has herself in-

icated this method by copiously secreting a clear vaginal fluid before and during labour, and the rush of liquor annii immediately preceding birth; the action of these fluids is more than mechanical, for experiment proves that a freely diluted blennorrhœal secretion is non-infectious, although, to be with certainty innocuous, it should not be more than 1 per cent.

(3) By assisting the foetal eyes to pass beyond the perinæal edge without resting. This is easily done by hooking the finger round the perinæal edge and drawing it down.

(4) By wiping the eyes with a clean cloth at birth of head.

(5) By instilling an antiseptic solution into the child's eyes at birth, *if the mother is known to have vaginal discharge*. To do this in all cases is unnecessary. Credé's method—solution used, argent. nit. 2 per cent.

(6) To wash the face first, never in the water in which the body has been cleansed.

(7) To retain one sponge or flannel specially for the child's face, and to insist on scrupulous cleanliness.

(8) The nurse to wash her hands after adjusting the mother, before touching the child.

(9) Not to unduly expose the child to bright light, draughts, &c.

(10) To protect the child from flies, with a thin veil.

(11) To carefully remove the child from the immediate vicinity of another similarly attacked. (General Isolation.) I cannot too forcibly reiterate that "ophthalmia neonatorum" is an infectious disease, and all medical officers or superintendents of crèches, workhouse schools, or hospitals should treat it as such, and remove the infected child to an isolation ward at once.

(12) To guard the one eye if the other is affected. (Special Isolation.) This is very difficult in infants, and depends entirely on the care and intelligence of the nurse, the constant removal of discharge, and the general watchfulness which cannot be defined.

(13) To print and diffuse through every family such aphorisms as are advisable and easily understood. The Ophthalmological Society of the United Kingdom of Great Britain and Ireland took action in this matter on the report of a paper by Dr. McKeown. The society, through its officers, pressed upon the Government the advisability of printing and distributing a card with the vaccination notice, to every family, on the necessity of "immediate surgical treatment in all cases of mattery discharge from the eyes of infants." The expense of the printing and distribution prevented the Government from entertaining the proposition.

(14) To specially instruct all nurses and midwives in these rules, and to point out to all medical practitioners the necessity of seeing them carried out in their entirety.

[THERAPEUTIC NOTE ON THE SALTS OF METALS AND OTHER ASTRINGENTS.]

It may be necessary to utter a word of explanation and warning on the astringents and caustics to be used:—

(a) Solutions of silver nitrate occasionally, though rarely, stain the ocular conjunctiva if the excess of solution be not washed away. Some writers suggest the use of sodium chloride solution to entirely neutralise the salt; we have found pure water sufficient.

(b) Solutions of lead should never be used where there is a corneal abrasion, or an insoluble carbonate or albuminate may be formed on the abraded surface requiring an operation for its removal, or in severe cases invading the corneal layers as an interstitial deposit and causing permanent blindness.

(c) Solutions of zinc will in corneal ulceration form deposits not unlike lead films. This is not generally known, but I have observed and commented upon the fact not infrequently.

(d) Solutions of iron are not used for local application.

(e) Cupri. sulphate, in crystal, is applied to hypertrophied papillæ with benefit.

(f) Alumina. Alum. sulphate is the most useful and least harmful astringent known; it never deposits, and exercises a powerful topical effect upon the conjunctiva.

(g) Boracic acid (solution of) besides being astringent is antiseptic and generally useful.

(h) Tannin, in glycerine, is valuable when applied to raw and eczematous lids when scalded and irritated by the purulent discharge of ophthalmia neonatorum].

DISINFECTION OF THE EYES AT BIRTH.

I know of no statistics similar to those of Kœnigstein (quoted by Fuchs, p. 129, "Cause and Prevention of Blindness"), and it is essential to give them a place in this memoir. Kœnigstein first observed 1,092 children without treating them at birth; in another series of 1,541 children a 1 per cent solution of carbolic acid was used; in a third series Credé's method, 2 per cent solution of arg. nit.

	No. of New-born Children.	Opt. Neon.
No treatment	1,092 ..	19.26
1 per cent carbolic	1,541 ..	7.42
2 per cent silver	1,250 ..	5.44

These figures speak for themselves. At the same time I repeat that "*unless vaginal discharge is known to exist this treatment is uncalled for.*"

"CURATIVE" TREATMENT.

A perfect knowledge of the "curative" treatment of ophthalmia neonatorum is of primary importance; if carried out promptly and efficiently, corneal complications can scarcely arise. Once only, after

a long experience, have I known ophthalmia neonatorum destroy vision by corneal ulceration, when the child was well nursed and under the care of a skilled ophthalmic surgeon from the commencement of the attack—this case has always been a mystery to me. I shall speak dogmatically of “Treatment,” because we have tried every plan, and the one we now use is that suggested by Graefe, with certain modifications, the outcome of our own experience, and the belief that it is the best for those placed under our care.

The child is usually brought to the surgeon when the third or purulent stage is reached ; it is rarely that we have the opportunity of trying to abort it during the second stage. Let me here suggest that if the case is a severe one, and the surgeon is not skilled in the treatment of eyes, he will act wisely by transferring it to a specialist as soon as possible. If then a child is brought to the surgeon with evident marks of ophthalmia neonatorum, every stage of the examination and treatment should be conducted with the utmost gentleness.

The mother or nurse should first wash the eyes in warm water to remove the secretion and free the lids. The surgeon should be seated in a convenient chair, with a folded towel across his knees, and with medical appliances within reach of his hand. These appliances are : (1) A plentiful supply of pieces of clean rag ; (2) Solutions of argenti. nit. 5gr. to loz., and 10gr. to loz. ; (3) Vessel of clean water ; (4) Two camel-hair pencils to apply the solutions and wash the excess of fluid away ; (5) A bottle of eserine, 5gr. to loz., and dropper (Fig. 1) ; (6) Lid elevators (Fig. 2). He then receives the head between his knees, yet supported by the towel. The nurse tucking the child's legs under her left arm, supports the body on her raised knee, holds the child's hands with one hand, and has the other at liberty to assist the surgeon. The surgeon first proceeds to examine the condition of the cornea by gently raising the upper lid with his finger—if there is any difficulty in this manœuvre he uses an elevator. A bent hair pin often answers admirably. He next everts the lids, wipes them dry, paints them with the silver solution of the required strength, taking special care to get to the *back folds of the conjunctiva*, and washing off the excess of solution with clean water, carefully replaces the lids by drawing them downwards and away from the globe. This process is repeated by the surgeon every morning until the disease is arrested, his object being to produce a slight eschar, which either destroys the micro-organisms or prevents their multiplication. The effect lasts about twelve hours. In severe cases the solution can be reapplied at night. However careful the surgeon may be his efforts are of little avail unless he is ably seconded by the nurse. Her duties are—to prevent the re-collection of pus, by constantly opening the lids and wiping the matter away with clean rags ; to wash the conjunctivæ with a weak alum or

boracic acid solution, 3gr. to 1oz. ; to anoint the lid margin with cerate to prevent adherence, and to combat the feverish restlessness by fresh air and careful attention to diet.

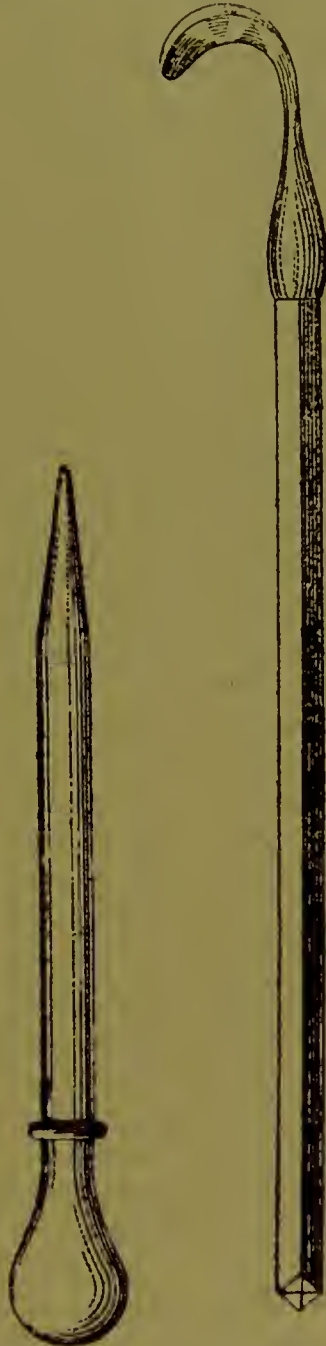


FIG. 1.

FIG. 2

TREATMENT OF COMPLICATIONS.

Lids: Lympho-membranous deposit when present should be carefully wiped away, and the raw surface painted with solution of quinine sul-

phate. The local lid stasis may be further relieved by mild mercurial purgation. Treatment as in an ordinary case of ophthalmia neonatorum may be resumed, care being taken to note that *the thinner or more scanty the discharge the weaker should be the caustic solution.*

Short lids—resulting retention of pus: It is my usual practice in cases of adult gonorrhœal ophthalmia to cut the outer canthus at an early stage of the disease. With greater elasticity of the lids in infants, this has so far not been considered necessary, as constant attention to drainage on the part of the nurse is usually sufficient to neutralise this disadvantage.

Corneal ulcerations: If corneal ulceration be present, it is no bar to the use of the silver solution, but is an indication for increased watchfulness, the use of the eserine sulphate, 4gr. to 1oz., and more energetic cleanliness on the part of the nurse. Should the ulceration progress to perforation, the same treatment is adopted until all discharge ceases. We have before stated that with the commencement of repairs we are able to appraise the ordeal through which the eye has passed. When do the efforts of nature require to be supplemented by the surgeon's art? *Not until the discharge has ceased*—except under one condition—that condition being *a large central perforation of the cornea, with forward pressure of the lens.* It is the pressure of the lens that prevents cicatrization; it must therefore be removed. Here our operative procedures stop, for removal of an adherent iris, apart from the difficulty of its excision, presents fresh cut surfaces and open lymph spaces to infecting micro-organisms, which would thus be enabled to enter the globe and cause panophthalmitis.

Impending corneal perforation: Shall we open the anterior chamber to anticipate perforation?

Such is not our practice, for three reasons:—

(1) Sclerotomy—the best operation—is so difficult under the existing conditions, that it would be a serious menace to the eye to attempt it, whilst tapping the base of the ulcer only precipitates the perforation, and does no good.

(2) Since De Weeker introduced eserine in the treatment of corneal ulcer, the most desperate conditions have recovered before perforation, and we never feel justified in interfering with the knife whilst hope of natural recovery exists.

(3) Our experience leads us to believe that, if perforation must occur, the selection of the perforating point is better left to nature, cure not infrequently resulting with comparatively slight opacity. The reader will understand that this refers only to ulcers in ophthalmia neonatorum. Where there is neither onyx nor hypopyon, the treatment of Sæmisch's *ulcus corneæ* attacking the adult is based on very different premises.

Leucomata: When eccentric may be treated cosmetically. When central, visually and cosmetically. "Visually," by an iridectomy selected for visual purposes. "Cosmetically," by tattooing the opacity with a suitable pigment, which assists vision by preventing the diffusion of light, and exercises a curative effect upon an irritable leucomatous spot by blocking the vessels. When the iris is involved in the cicatrix, the name of "leucoma adhærens" is given to it, and we may accept as proven that unless the iris is adherent to the cornea there will be no protrusion of the cicatricial tissue. To obviate this, our utmost efforts must be used, by removal of an irritating lens, the use of pressure and eserine, and at the earliest moment after the discharge has ceased, separation of the iris from the contracting cornea, or a large iridectomy. Should none of these avail, we have a gradually forming rounded protrusion, termed a staphyloma anterior. With a commencing staphyloma there must be increased tension of the eyeball, and vision is practically reduced to 0. We therefore consider—first, the effect of its retention on the other eye; secondly, the cosmetic results to be obtained. It is a sound ophthalmic maxim "that no eye that can be retained without risk, and can be made of fairly good appearance, should be discarded," for a poor natural eye is superior to the most brilliant artificial effort.

The use of iodoform in these cases has been much extolled. We have been disappointed, for in ophthalmia neonatorum it appears to us to be comparatively valueless, whilst in corneal ulceration with little secretion, or commencing infection of corneal sections, it is almost magical in its arresting power.

NEBULÆ AND THEIR TREATMENT.

All nebulous opacities in front of the layers of the true cornea (although they may be underneath the epithelium) can be removed. This should be done as soon as their position is determined and the eye quiet, by local irritants, or if they fail, by scraping. Opacities that involve change in the true corneal layers or are due to interstitial deposit cannot be *directly* removed by operation but may be *indirectly* influenced by freeing the efferent channels. *Note the tension carefully.* If increased or doubtful, perform sclerotomy at once; if that is insufficient, an iridectomy carefully selected to give the best visual results. There is a corneal cloudiness without any increase of tension which is really a pre-glaucomatous state; it never clears without operation, and in these cases, an iridectomy being followed by rapid return of transparency, the patient is left with a large coloboma; here sclerotomy should always be given a trial before iridectomy to obviate this visual disadvantage.

IRRITANTS.

Local irritants, by the hyperæmia they cause, are often valuable in removing superficial nebulæ and small ulcers. Of these Crémér's Pomade

and Pagenstecher's Ungt. hold the first place. Should these fail no other need be attempted. They are introduced into the eye with a brush, their action assisted by gentle rubbing on the closed lids (massage), and the remaining ointment washed out in four or five minutes. A few drops of solution of cocain 5 gr. to 1 oz. introduced into the eye a few minutes previously render this operation painless.

Crêmer's Pomade.—Hydrarg. oxyd. flav. cum crem. frigid. Proportions unknown.

Pagenstecher's Ungt.—Hyd. ox. flav. amorphous, 30 gr. to minolin 1 oz.

STAPHYLOMA ANTERIOR—INFANTS—ITS TREATMENT.

A staphyloma may be partial or complete—partial when a portion of the cornea is involved (it is then eccentric); complete when the whole corneal cicatrix, even to the anterior part of the sclera, is pushed forward.

With partial staphyloma a large timely iridectomy may not only arrest the disease, but may be followed by the recession of the projecting portion. Then subsequent tattooing of the leucoma, which is so often associated with staphyloma, will enable the patient to retain an organ of inestimable value for cosmetic purposes, though visually faulty. If the staphyloma does not recede with iridectomy, a Graefe's knife passed through it in its long diameter, and the removal of a semi-lunar flap, with pressure bandaging, may be tried.

COMPLETE ANTERIOR STAPHYLOMA.

With complete staphyloma we know that vision is hopelessly lost. Why, then, should we interfere? (1) A staphylomatous cornea is often painful, always unsightly. (2) The whole globe—especially in infants—enlarges, distension of the orbital walls and absorption of the orbital fat take place, and if the eye is removed a large cavity remains, which no artificial eye can fill. How, then, shall we treat it? (1) By operating before distension has unduly enlarged the orbital cavity. (2) By a judicious selection of the operation to obtain the best cosmetic effects.

I will not discuss the operations which we mention only to condemn—abscission, seton, Borelli's—but hasten to the three now in vogue—enucleation, evisceration, and evisceration with the addition of artificial vitreous.

My conviction is very strong, "that any surgeon who enucleates a staphylomatous eyeball in a young person does a great and irreparable injury to his patient."

I have now operated on a large number of patients by antiseptic evisceration of the globe, with excellent results. The operation of evisceration of the globe—antiseptically—with introduction of a hollow glass globe to remain permanently imbedded as a movable stump upon

which to adapt an artificial eye is now so well known as to require little description. The stump retains all the associated movements *ad maximum* and may even be tattooed. (**British Medical Journal*, Dec. 19, 1885.) Of these, the operation (now known by the name of the writer of this paper) leaves nothing to be desired, the resulting stump being insensitive and admirably adapted to the purpose required, and I am persuaded that no surgeon who has tried this operation will revert to enucleation.

SHRUNKEN GLOBES—TREATMENT IN THEIR RELATION TO SYMPATHETIC DISEASE.

The treatment of shrunken globes, the result of ophthalmia neonatorum, is determined by the risk to the sound eye of secondary septic infection (sympathetic ophthalmitis). I have notes of cases of this nature which completely disprove, should disproof be required, that panophthalmitis prevents secondary invasion of the sound eye. Here, if ever, sound judgment is required, and I advise that the shrunken globes be opened antiseptically, the contents removed, and the sclera alone left to form a painless, harmless stump for the adaptation of an artificial eye. (See *British Medical Journal*, Dec. 19, 1885.)

FINIS.

In these pages I have endeavoured to give a complete account of the cause, symptoms, complications, prevention, and treatment of ophthalmia neonatorum. Above all I have endeavoured to be practical. It may be that others view the causes and treatment from different standpoints to me; they will doubtless make them known. That I could have wandered more into detail is evident, but I feel that I owe an apology to my readers for the length of this monograph; but I present it with confidence founded on my own experience, as well as that of others, that treatment on the principles here laid down will meet with undoubted success.

* Careful rules for the treatment of lost eyes by evisceration, &c., are found in this communication (refer if needful).

